Mental Health and Lifestyle Journal

Year 2025
Volume 3
Issue 4

# The Effect of Coping Strategies, Psychological Distress, and Psychological Flexibility on Pain Catastrophizing with the Mediating Role of Emotion Regulation

Azin. Fathi[1], Simin. Arab[1*], Reza. Ebrahimirad[2]

1 Department of Medical Sciences, To.C., Islamic Azad University, Tonekabon, Iran
2 Department of Medical, To.C., Islamic Azad University, Tonekabon, Iran

*Correspondence: s_arab@toniau.ac.ir

Article type:
Original Research

Article history:
Received 03 May 2025
Revised 21 August 2025
Accepted 11 September 2025
Published online 01 September 2025

## ABSTRACT

This study aimed to investigate the predictive role of coping strategies, psychological distress, and psychological flexibili ty on pain catastrophizing, while examining the mediating role of emotion regulation in patients with migraine. In a descriptive-analytical design, 200 migraine patients (124 women, 62%; 76 men, 38%; mean age = 35.5 years, SD = 8.12) were recruited from two specialized pain clinics in Tehran between September and December 2024. Participants completed validated questionnaires, including the Pain Catastrophizing Scale (PCS), Coping Strategies Questionnaire (CSQ), Kessler Psychological Distress Scale (K10), Persian Psychological Flexibility Index (P-PPFI), and Emotion Regulation Questionnaire (ERQ). Data were analyzed using SmartPLS 4.0.9, with assessment of measurement reliability and validity, and structural equation modeling tested with bootstrapping (5,000 resamples). Psychological distress directly predicted higher pain catastrophizing ($\beta = .41$, $p < .001$), while psychological flexibility reduced catastrophizing both directly ($\beta = -.29$, $p < .001$) and indirectly via emotion regulation ($\beta = -.14$, $p = .001$). Coping strategies showed differential effects: distraction ($\beta = -.17$, $p = .008$) and reappraisal ($\beta = -.19$, $p = .004$) reduced catastrophizing, whereas attention to pain increased it ($\beta = .22$, $p = .002$). Among emotion regulation strategies, cognitive reappraisal predicted lower catastrophizing ($\beta = -.23$, $p = .001$), whereas expressive suppression predicted higher catastrophizing ($\beta = .18$, $p = .009$). Model fit indices confirmed adequacy ($\chi^2/df = 1.37$; CFI = .95; RMSEA = .041). Findings suggest that psychological distress is a primary risk factor for pain catastrophizing in migraine patients, whereas psychological flexibility and adaptive coping serve protective functions through emotion regulation. Integrative interventions targeting distress, flexibil ity, and regulation strategies may reduce catastrophizing and improve clinical outcomes.

**Keywords:** Pain catastrophizing; psychological distress; coping strategies; psychological flexibility; emotion regulation; migraine

**How to cite this article:**
Fathi, A., Arab, S., & Ebrahimirad, R. (2025). The Effect of Coping Strategies, Psychological Distress, and Psychological Flexibility on Pain Catastrophizing with the Mediating Role of Emotion Regulation. *Mental Health and Lifestyle Journal, 3*(4), 1-12. https://doi.org/10.61838/mhlj.3.4.4

## Introduction

Chronic pain represents one of the most challenging health conditions worldwide, not only because of its high prevalence but also due to its complex interactions with psychological, cognitive, and emotional factors. It is increasingly recognized that the experience of pain cannot be fully explained by biomedical mechanisms

alone, but instead emerges from the interplay of biological, psychological, and social dimensions, consistent with the biopsychosocial model of pain (1, 2). Among the numerous psychological constructs relevant to chronic pain, pain catastrophizing, psychological distress, coping strategies, and emotion regulation have attracted significant attention in contemporary research (3-5).

Pain catastrophizing, defined as a maladaptive cognitive-emotional response involving rumination, magnification, and helplessness, is one of the strongest predictors of pain severity, disability, and reduced quality of life (6, 7). It has been demonstrated across various chronic pain conditions, including fibromyalgia, migraine, pelvic pain, and musculoskeletal disorders (8-10). Catastrophizing intensifies the subjective experience of pain and interferes with adaptive coping, creating a cycle of worsening symptoms and distress (11, 12). This phenomenon is also a key mediator between psychological distress and pain outcomes, linking emotional vulnerabilities such as anxiety and depression with increased perception of pain (13, 14).

The literature shows that catastrophizing is not only a cognitive style but also a multidimensional construct influenced by clinical and socio-demographic predictors (13). For example, in patients with fibromyalgia, catastrophizing mediates the relationship between functional capacity and pain intensity (3), while in individuals with Parkinson's disease, catastrophizing contributes to the worsening of psychological distress and disability (7). Similarly, in endometriosis patients undergoing surgery, pre-existing catastrophizing levels can negatively affect health-related quality of life postoperatively (4). These findings highlight the need to study catastrophizing in a wide range of populations and to identify psychological factors that may moderate or mediate its effects.

Psychological distress, including symptoms of depression and anxiety, is one of the most consistent correlates of chronic pain outcomes. Elevated distress has been linked to increased pain intensity, greater interference in daily activities, and decreased life control (15, 16). In clinical cohorts of thousands of patients with chronic pain, psychological distress has emerged as a stronger predictor of functional impairment than pain intensity itself (15). Importantly, distress and catastrophizing are reciprocally reinforcing processes: distress fuels catastrophic thinking, while catastrophizing exacerbates distress, forming a vicious cycle that sustains chronic pain (1, 6). Moreover, psychological distress has been implicated in various pain-related conditions, ranging from pelvic pain (9) to orofacial pain (10) and psoriatic arthritis (17).

Coping strategies represent another central mechanism by which individuals manage chronic pain. Coping is typically divided into adaptive and maladaptive responses, with adaptive strategies such as distraction and cognitive reappraisal associated with better adjustment, and maladaptive strategies like attention to pain linked with greater disability (2, 10). For example, in chronic orofacial pain, coping strategies significantly predicted pain-related outcomes and disability (10). Similarly, in females with fibromyalgia, coping strategies interacted with catastrophizing and pain acceptance, shaping overall well-being (2). The selection and effectiveness of coping strategies may also be moderated by individual differences in psychological flexibility and executive functioning (11), highlighting the need to integrate coping constructs into models of pain adjustment.

Emotion regulation, defined as the processes by which individuals influence the onset, intensity, and expression of emotions, is particularly relevant in chronic pain contexts (18). Strategies such as cognitive reappraisal are generally protective, reducing negative affect and pain catastrophizing, whereas expressive suppression tends to exacerbate distress and dysfunction (19). For instance, research in chronic orofacial

pain patients has shown that poor emotion regulation, combined with psychological health problems, predicts worse oral health-related quality of life (19). Similarly, adolescents with chronic pain who rely on maladaptive emotional processes are more likely to increase pain medication use (18). These findings demonstrate that emotion regulation is not merely a background factor but an active mediator between psychological vulnerabilities and pain-related behaviors.

The role of psychological flexibility, conceptualized as the ability to adapt thoughts and behaviors to changing circumstances while maintaining valued goals, has also been emphasized in chronic pain research (2). Higher flexibility is associated with lower catastrophizing and better pain acceptance, while reduced flexibility fosters maladaptive coping and distress. In males with pelvic pain, for example, reduced flexibility was associated with both pain and sexual dysfunction (8). Such findings highlight the multidimensionality of psychological functioning in chronic pain, where flexible emotion regulation and coping mechanisms may buffer the effects of catastrophizing and distress.

The transition from acute to chronic pain, particularly in postsurgical and traumatic contexts, has been the subject of longitudinal studies emphasizing the role of psychological mechanisms. For example, in youth undergoing spinal fusion, psychosocial variables such as catastrophizing, emotion regulation, and family support predicted the persistence of pain over six months (20). Similarly, in patients after knee arthroplasty, preoperative psychological predictors, including distress and catastrophizing, determined the risk of developing chronic postsurgical pain (21). These results suggest that interventions targeting psychological factors may reduce the likelihood of pain chronification.

Other studies further emphasize the role of socio-demographic and condition-specific moderators. For instance, in hallux valgus patients, psychological factors including distress and catastrophizing influenced pain perception and functional impairment (5). In breast cancer survivors with pain, psychological factors strongly predicted healthcare utilization patterns (22). In psoriatic arthritis and osteoarthritis patients, distinct psychological profiles emerged, linking sensory pain testing with emotional and cognitive responses (17). These findings underscore the importance of considering both medical and psychosocial dimensions of chronic pain conditions.

Despite accumulating evidence, gaps remain in understanding how coping strategies, psychological distress, flexibility, and emotion regulation jointly shape pain catastrophizing. Most studies have examined these constructs in isolation, overlooking their potential interactions. For example, while catastrophizing has been widely studied, fewer investigations have simultaneously tested the mediating role of emotion regulation strategies such as reappraisal and suppression (18, 19). Similarly, while coping and flexibility have each been associated with pain outcomes, their joint contributions to catastrophizing and their interplay with distress remain less understood (2, 13). Moreover, cultural and contextual factors may influence the use of coping and regulation strategies, as well as the prevalence of distress and catastrophizing (6, 14).

Therefore, the present study seeks to examine the effects of coping strategies, psychological distress, and psychological flexibility on pain catastrophizing, with the mediating role of emotion regulation, in a clinical sample of patients with migraine. By integrating these constructs within a structural equation modeling framework, this research addresses existing gaps in the literature and provides a comprehensive understanding of psychological predictors and mediators in pain catastrophizing. Building on prior studies

that highlight the interplay between distress, coping, and regulation in various pain conditions (3, 4, 7, 17), the current study contributes to advancing both theoretical and clinical knowledge.

Understanding these mechanisms is not only theoretically significant but also clinically relevant. Interventions targeting catastrophizing, such as cognitive-behavioral therapy, mindfulness-based interventions, and acceptance-based approaches, have demonstrated efficacy in reducing pain-related disability and improving quality of life (2, 10). However, more nuanced approaches that simultaneously target distress, flexibility, coping, and emotion regulation may yield stronger and more sustainable outcomes (11, 13). This integrated perspective is critical in designing tailored interventions for populations with high vulnerability to catastrophizing, such as migraine patients.

In summary, pain catastrophizing emerges as a central psychological process linking distress, coping, and emotion regulation in chronic pain populations. The literature demonstrates consistent associations across various clinical contexts, yet highlights the need for integrative models that examine these constructs simultaneously. The present study aims to fill this gap by testing a structural model in migraine patients, evaluating both direct and indirect pathways. The findings have the potential to inform prevention and intervention strategies, ultimately contributing to improved psychological and clinical outcomes in chronic pain management.

## Methods and Materials

### *Study Design and Participants*

This descriptive-analytical study was conducted on 200 migraine patients (124 women, 62%; 76 men, 38%; mean age = 35.5 years, SD = 8.12) from two specialized pain clinics in Tehran. Out of 350 patients who visited between September and December 2024, 200 individuals (participation rate = 57%) met the inclusion criteria: age ≥ 18 years, a migraine diagnosis of at least three months confirmed by a neurologist based on ICHD-3 criteria (Headache Classification Committee, 2018), and the ability to independently complete the questionnaires. Exclusion criteria included other chronic physical illnesses (e.g., diabetes or rheumatoid arthritis) or severe psychiatric disorders (e.g., schizophrenia or bipolar disorder).

The questionnaires were completed in a quiet room at the clinics within 25–30 minutes. To reduce response bias, the order of the questionnaires was randomized, and standardized instructions were provided uniformly. Data were collected confidentially and stored in a secure database.

### *Data Collection*

**Pain Catastrophizing Scale (PCS):** This 13-item instrument measures rumination, magnification, and helplessness using a 5-point Likert scale (0 = not at all, 4 = always; α = 0.896). The scale has been validated in Iran and is suitable for clinical populations (Sullivan et al., 1995).

**Coping Strategies Questionnaire (CSQ):** This 48-item instrument assesses coping strategies (distraction, reappraisal, attention to pain) using a 7-point Likert scale (0 = never, 6 = always; α = 0.684) (Rosenstiel & Keefe, 1983).

**Kessler Psychological Distress Scale (K10):** This 10-item tool measures anxiety and depression symptoms during the past 30 days using a 5-point Likert scale (1 = never, 5 = always; α = 0.871) (Kessler et al., 2002).

**Persian Psychological Flexibility Index (P-PPFI):** Includes subscales of avoidance, acceptance, and control, assessed with a 7-point Likert scale (α = 0.844). This tool has been validated for the Iranian population (Akbari et al., 2021).

**Emotion Regulation Questionnaire (ERQ):** This 10-item scale measures cognitive reappraisal (6 items) and expressive suppression (4 items) on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree; α = 0.766) (Gross & John, 2003). The instrument has been validated in Iran for assessing emotion regulation in chronic patients.

### *Data analysis*

Data were analyzed using SmartPLS version 4.0.9. The measurement model was evaluated for reliability (Cronbach's alpha, composite reliability) and validity (convergent validity with AVE > 0.5, discriminant validity with the Fornell–Larcker criterion). The structural model was assessed using bootstrapping (5,000 samples), and model fit indices (GOF, $R^2$, $Q^2$) were calculated. Additional analyses included examination of moderating effects of gender and age using multi-group analysis (MGA) and interaction effects within the PLS-SEM model. To analyze cultural belief correlations, an open-ended questionnaire was designed to identify pain-related beliefs, which were qualitatively coded and correlated with PCS scores.

## Findings and Results

Table 1 presents the means and standard deviations for all study variables. Psychological distress showed the highest mean (M = 27.84, SD = 6.91). Among coping strategies, reappraisal had the highest mean (M = 42.19, SD = 7.32), while attention to pain was the lowest (M = 32.41, SD = 6.85). In emotion regulation, cognitive reappraisal scored higher (M = 27.14, SD = 5.24) compared with expressive suppression (M = 15.04, SD = 4.36).

**Table 1. Descriptive Statistics for Study Variables (N = 200)**

| Variable | M | SD |
|---|---|---|
| Pain Catastrophizing (PCS) | 25.36 | 7.25 |
| Coping – Distraction | 46.87 | 8.91 |
| Coping – Reappraisal | 42.19 | 7.32 |
| Coping – Attention to Pain | 32.41 | 6.85 |
| Psychological Distress (K10) | 27.84 | 6.91 |
| Psychological Flexibility | 68.29 | 10.41 |
| Emotion Regulation – Cognitive Reappraisal | 27.14 | 5.24 |
| Emotion Regulation – Expressive Suppression | 15.04 | 4.36 |

These results show that adaptive strategies such as reappraisal and cognitive reappraisal were relatively more frequently used than maladaptive responses like attention to pain and suppression.

Table 2 reports the Pearson correlations among the study variables. Pain catastrophizing was positively correlated with psychological distress ($r = .54$, $p < .001$) and attention to pain ($r = .31$, $p < .001$), while negatively correlated with distraction ($r = -.21$, $p = .004$), reappraisal ($r = -.25$, $p = .001$), psychological flexibility ($r = -.41$, $p < .001$), and cognitive reappraisal ($r = -.34$, $p < .001$). Expressive suppression showed a small positive association with pain catastrophizing ($r = .18$, $p = .011$).

**Table 2. Pearson Correlations Between Study Variables (N = 200)**

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1. Pain Catastrophizing | — | | | | | | | |
| 2. Coping – Distraction | −.21** | — | | | | | | |
| 3. Coping – Reappraisal | −.25*** | .36*** | — | | | | | |
| 4. Coping – Attention | .31*** | −.19* | −.16* | — | | | | |
| 5. Psychological Distress | .54*** | −.14 | −.18* | .22** | — | | | |
| 6. Psychological Flexibility | −.41*** | .29*** | .27*** | −.21** | −.39*** | — | | |
| 7. ER – Cognitive Reappraisal | −.34*** | .25*** | .33*** | −.22** | −.32*** | .48*** | — | |
| 8. ER – Expressive Suppression | .18* | −.12 | −.19* | .21** | .27*** | −.26*** | −.31*** | — |

These findings support the mediating role of adaptive versus maladaptive emotion regulation pathways in pain catastrophizing.

Table 3 demonstrates the structural model fit indices. The model achieved strong goodness of fit, with $\chi^2/df = 1.37$, GFI = .92, AGFI = .90, CFI = .95, TLI = .94, and RMSEA = .041.

**Table 3. Model Fit Indices for the Structural Model**

| Fit Index | Value |
|---|---|
| $\chi^2$ | 214.38 |
| df | 156 |
| $\chi^2/df$ | 1.37 |
| GFI | .92 |
| AGFI | .90 |
| CFI | .95 |
| TLI | .94 |
| RMSEA | .041 |

The indices confirm an excellent fit, showing that the hypothesized model adequately represented the observed data.

Table 4 provides the path coefficients for direct, indirect, and total effects. Psychological distress directly predicted higher pain catastrophizing ($\beta = .41$, $p < .001$). Adaptive coping (distraction, reappraisal) and cognitive reappraisal reduced pain catastrophizing both directly and indirectly. Maladaptive coping (attention to pain) and expressive suppression increased pain catastrophizing. The strongest indirect pathway was from psychological flexibility through cognitive reappraisal to pain catastrophizing ($\beta = -.14$, $p = .001$).

**Table 4. Total, Direct, and Indirect Effects in the Structural Model**

| Path | b | S.E | β | p |
|---|---|---|---|---|
| Distress → Pain Catastrophizing (direct) | 0.39 | 0.07 | .41 | <.001 |
| Flexibility → Pain Catastrophizing (direct) | −0.27 | 0.08 | −.29 | <.001 |
| Coping – Distraction → Pain Catastrophizing | −0.16 | 0.06 | −.17 | .008 |
| Coping – Reappraisal → Pain Catastrophizing | −0.18 | 0.06 | −.19 | .004 |
| Coping – Attention → Pain Catastrophizing | 0.21 | 0.07 | .22 | .002 |
| ER – Cognitive Reappraisal → Catastrophizing | −0.22 | 0.07 | −.23 | .001 |
| ER – Suppression → Catastrophizing | 0.17 | 0.06 | .18 | .009 |
| Flexibility → Cognitive Reappraisal (direct) | 0.34 | 0.08 | .36 | <.001 |
| Flexibility → Suppression (direct) | −0.25 | 0.07 | −.26 | .001 |
| Indirect: Flexibility → ER → Catastrophizing | −0.14 | 0.05 | −.14 | .001 |
| Indirect: Coping → ER → Catastrophizing | −0.10 | 0.04 | −.11 | .005 |
| Total: Distress → Catastrophizing | 0.45 | 0.08 | .47 | <.001 |
| Total: Flexibility → Catastrophizing | −0.38 | 0.07 | −.41 | <.001 |

These results show that while psychological distress remains the strongest risk factor, adaptive coping and emotion regulation processes function as protective factors, whereas maladaptive strategies increase vulnerability to catastrophic pain thinking.

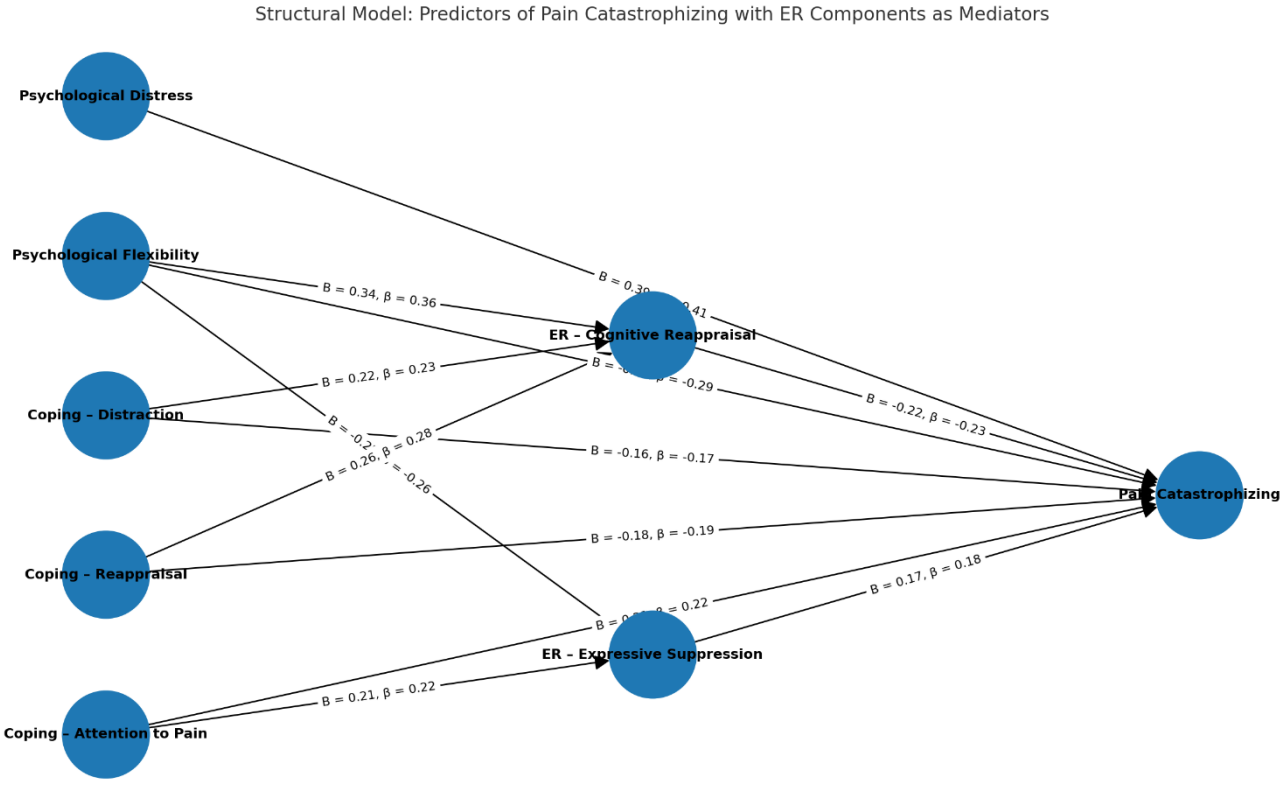


**Figure 1. Final Model of The Study**

## Discussion and Conclusion

The present study investigated the effects of coping strategies, psychological distress, and psychological flexibility on pain catastrophizing, while also testing the mediating role of emotion regulation in a clinical sample of migraine patients. The findings revealed several important relationships. First, psychological distress showed a strong direct positive association with pain catastrophizing, consistent with prior literature emphasizing the reinforcing cycle between emotional suffering and maladaptive pain cognitions (13, 15). Second, psychological flexibility emerged as a significant protective factor, both directly reducing catastrophizing and indirectly buffering its effects through emotion regulation processes such as cognitive reappraisal and suppression. Third, coping strategies demonstrated mixed effects: adaptive strategies like distraction and reappraisal were associated with lower catastrophizing, whereas maladaptive attention to pain predicted higher catastrophizing levels. Finally, emotion regulation partially mediated these associations, highlighting the central role of cognitive reappraisal and suppression as mechanisms linking flexibility and coping to catastrophic thinking.

These findings contribute to the expanding body of research on the psychosocial determinants of pain catastrophizing and extend previous studies by examining a more integrated model that includes multiple predictors and mediators. They also provide insights for tailoring psychological interventions in migraine and other chronic pain populations.

The strong direct effect of psychological distress on catastrophizing aligns with prior evidence that depression and anxiety amplify maladaptive cognitive patterns related to pain (1, 14). For instance, a registry-based study of over 40,000 patients found that distress was more strongly associated with interference and lack of life control than pain intensity itself (15). Similarly, research on functional dyspepsia showed that distress exacerbated catastrophizing and pain imagery, reducing self-efficacy (14). The current findings confirm that migraine patients experiencing heightened distress are particularly vulnerable to catastrophic interpretations of pain. This supports the notion that interventions aiming to reduce psychological distress may directly diminish catastrophizing, thereby alleviating pain-related disability.

Our results also converge with findings in specific patient groups. In chronic pelvic pain, women with higher distress demonstrated more maladaptive cognitions and reduced quality of life (9). In psoriatic arthritis and osteoarthritis, distress was found to interact with sensory testing outcomes, shaping the pain experience (17). Such parallels highlight the generalizability of the distress–catastrophizing association across conditions. Additionally, the results extend work by (22), who demonstrated that distress predicted healthcare utilization among breast cancer survivors with pain, suggesting that distress-driven catastrophizing may also increase health system burden.

The study confirmed that higher psychological flexibility was associated with lower levels of catastrophizing. This is consistent with models that conceptualize flexibility as the capacity to adaptively regulate thoughts, emotions, and behaviors in the face of pain (2). Research on fibromyalgia patients revealed that greater acceptance and flexibility reduced reliance on catastrophizing and improved functioning (2). Similarly, in males with pelvic pain, low flexibility was linked to higher distress and dysfunction (8). By incorporating emotion regulation into the model, our findings show how flexibility exerts its protective role partly through enhancing reappraisal and reducing suppression.

Comparable patterns were also observed in youth undergoing spinal fusion surgery. In that context, psychosocial factors including flexibility and catastrophizing predicted the persistence of postsurgical pain over six months (20). This suggests that flexibility is not only relevant for established chronic pain but also for transitions from acute to chronic conditions. Our results therefore reinforce the value of flexibility-oriented interventions, such as acceptance and commitment therapy, in mitigating catastrophizing in migraine patients.

The multidimensional analysis of coping revealed differential effects. Distraction and reappraisal were associated with reduced catastrophizing, supporting the adaptive nature of these strategies. This echoes results in orofacial pain, where adaptive coping predicted better adjustment (10). Similarly, adolescents with chronic pain who employed constructive coping strategies were less likely to escalate medication use (18). Conversely, attention to pain predicted higher catastrophizing, consistent with evidence that hypervigilant coping maintains distress and magnifies pain perception (12).

Other studies have reported similar findings. For example, in hallux valgus patients, maladaptive psychological patterns including pain-focused coping predicted greater disability (5). In fibromyalgia, coping interacted with catastrophizing to predict well-being (2). Taken together, these findings confirm that not all coping strategies are beneficial, and that the effectiveness of coping depends on whether it facilitates disengagement from maladaptive pain cognitions or reinforces them.

A key contribution of this study is the demonstration of emotion regulation as a mediator between coping, flexibility, and catastrophizing. Specifically, cognitive reappraisal reduced catastrophizing, while expressive suppression increased it. This pattern reflects broader evidence linking emotion regulation to pain outcomes. For instance, among orofacial pain patients, poor emotion regulation predicted worse oral health-related quality of life (19). Similarly, adolescents with chronic pain who relied on maladaptive emotion regulation were more likely to misuse pain medication (18).

These findings align with theoretical perspectives that situate emotion regulation as a proximal mechanism shaping cognitive and behavioral responses to pain (6). They also resonate with the observation that catastrophizing is partly an emotional regulation failure, where individuals are unable to reframe or downregulate negative affect in response to pain (7). By confirming that reappraisal mediates protective effects and suppression mediates risk pathways, the current study underscores the importance of targeting emotion regulation in psychological interventions.

The integrated model tested here extends beyond studies examining single predictors. While catastrophizing has been widely studied, relatively few investigations have examined its joint associations with coping, flexibility, distress, and emotion regulation. For example, (3) showed that catastrophizing mediated the relationship between depression and pain intensity in fibromyalgia. Our study adds by showing that reappraisal and suppression mediate the flexibility–catastrophizing and coping–catastrophizing links. Similarly, while coping and distress have been examined separately, their combined effects mediated by emotion regulation had not been tested in migraine.

This integrated perspective reflects a growing recognition that psychosocial variables do not operate in isolation but in interconnected pathways. Studies on adolescents (18), postsurgical patients (20, 21), and cancer survivors (22) all emphasize the multiplicity of factors influencing chronic pain. The present study contributes by modeling these interrelations in migraine, highlighting both risk and protective mechanisms.

This study has several limitations. First, the cross-sectional design prevents conclusions about causal relationships among distress, coping, flexibility, emotion regulation, and catastrophizing. Longitudinal designs, such as those employed in postsurgical and adolescent pain research (20, 21), are needed to clarify temporal ordering. Second, reliance on self-report questionnaires raises concerns about shared method variance and response biases. Although validated instruments were used, future studies could incorporate behavioral or physiological measures of coping and regulation. Third, the sample consisted of migraine patients from specialized clinics in Tehran, which may limit generalizability to other populations and cultural contexts. Cultural variations in coping and emotion regulation have been highlighted in other studies (6, 14), suggesting that replication in diverse samples is warranted. Finally, the explained variance in catastrophizing, though substantial, indicates that other unmeasured factors such as personality traits, family environment, or neurobiological mechanisms may also play significant roles.

Future research should adopt longitudinal and experimental designs to test causality and mechanisms. Following approaches used in surgical recovery and youth cohorts (20, 21), studies could examine whether early interventions targeting distress and flexibility reduce the likelihood of chronic catastrophizing. Future research should also explore the interplay of coping and regulation strategies across cultural contexts, as cultural beliefs about pain may shape cognitive and emotional responses (6, 14). Furthermore, integrating multimodal assessments, including neuroimaging, ecological momentary assessment, and physiological

indicators, could provide richer insights into regulation processes. Comparative studies across conditions, such as fibromyalgia, endometriosis, and pelvic pain (4, 8, 9), would help clarify the generalizability of mechanisms. Finally, intervention studies should directly manipulate coping and regulation strategies to examine their causal role in reducing catastrophizing, building on existing psychological therapies.

The findings carry important clinical implications. Interventions for migraine and other chronic pain conditions should prioritize reducing psychological distress, fostering flexibility, and promoting adaptive coping and emotion regulation strategies. Cognitive-behavioral approaches could be refined to explicitly target catastrophizing while enhancing reappraisal and discouraging suppression. Acceptance- and mindfulness-based interventions may improve flexibility and pain acceptance, thereby reducing maladaptive cognitions. Tailoring interventions to patients' coping profiles—emphasizing distraction and reappraisal while discouraging attention to pain—may improve efficacy. Clinicians should also assess emotion regulation capacities and distress levels as part of routine pain management. Ultimately, a multimodal psychosocial intervention strategy addressing these interconnected factors may yield the greatest benefits for reducing catastrophizing and improving quality of life in migraine patients.

## Acknowledgments

The authors express their deep gratitude to all participants who contributed to this study.

## Authors' Contributions

All authors equally contributed to this study.

## Declaration of Interest

The authors of this article declared no conflict of interest.

## Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. After obtaining approval from the Research Ethics Committee of Islamic Azad University – Tonekabon Branch (code IR.IAU.TON.REC.2024.133), written informed consent was obtained from participants.

## Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

## Funding

This research was carried out independently with personal funding and without the financial support of any governmental or private institution or organization.

## References


1. Asanova A, Mukharovska I. Study of Psychological Phenomena in the Structure of Chronic Pain: Depression, Anxiety, Catastrophizing. Literature Review. Psychosomatic Medicine and General Practice. 2023;8(4). doi: 10.26766/pmgp.v8i4.505.
2. Droppert KM, Knowles SR. The Role of Pain Acceptance, Pain Catastrophizing, and Coping Strategies: A Validation of the Common Sense Model in Females Living With Fibromyalgia. Journal of Clinical Psychology in Medical Settings. 2022;30(2):445-52. doi: 10.1007/s10880-022-09873-w.
3. Montoro CI, Galvez-Sánchez CM. The Mediating Role of Depression and Pain Catastrophizing in the Relationship Between Functional Capacity and Pain Intensity in Patients With Fibromyalgia. Behavioural Neurology. 2022;2022:1-9. doi: 10.1155/2022/9770047.
4. Boersen Z. Psychological Factors Contributing to Health-Related Quality of Life Following Endometriosis Surgery: Results of a Cross-Sectional Study. Reproductive Sciences. 2025. doi: 10.1007/s43032-025-01899-3.
5. Kak A, Batra M, Erbas B, Sadler S, Chuter V, Jenkins J, et al. Psychological Factors Associated With Pain and Function in Adults With Hallux Valgus. Journal of Foot and Ankle Research. 2025;18(1). doi: 10.1002/jfa2.70030.
6. Asanova A, Ovdii MO, Mukharovska I, Skrynnyk O. The Role of Catastrophizing, Depression and Anxiety in Chronic Pain: A Cross-Sectional Pilot Study. International Neurological Journal. 2024;20(7):334-42. doi: 10.22141/2224-0713.20.7.2024.1113.
7. Zimmers S, Robieux L, Bungener C. Towards a Better Comprehension and Management of Pain and Psychological Distress in Parkinson's: The Role of Catastrophizing. Journal of Geriatric Psychiatry and Neurology. 2023;36(5):351-65. doi: 10.1177/08919887231154932.
8. Edvinsson M, Karlsson M, Linton SJ, Brattgård K, Solinger G, Flink I. Male Pelvic Pain: The Role of Psychological Factors and Sexual Dysfunction in a Young Sample. Scandinavian Journal of Pain. 2022;23(1):104-9. doi: 10.1515/sjpain-2021-0221.
9. López MM, Rodríguez MJL, García ÁM, García-Cid S, Royuela A, Pereira A. Psychological Profile in Women With Chronic Pelvic Pain. Journal of Clinical Medicine. 2022;11(21):6345. doi: 10.3390/jcm11216345.
10. Greenberg J, Bakhshaie J, Lovette BC, Vranceanu AM. Association Between Coping Strategies and Pain-Related Outcomes Among Individuals With Chronic Orofacial Pain. Journal of Pain Research. 2022;Volume 15:431-42. doi: 10.2147/jpr.s350024.
11. Cooper J. Relations Among Executive Functioning, Pain Catastrophizing, and Disability in Mild Traumatic Brain Injury Patients With Chronic Pain. 2024. doi: 10.32920/25219391.v1.
12. Plinsinga ML, Vuvan V, Maclachlan L, Klyne DM, Graven-Nielsen T, Vicenzino B, et al. Pain-Related Cognitions and Emotional Distress Are Not Associated With Conditioned Pain Modulation: An Explorative Analysis of 1142 Participants With Acute, Subacute, and Chronic Pain. Pain. 2023;164(7):1593-9. doi: 10.1097/j.pain.0000000000002864.
13. Asanova A, Хаустова O, Skrynnyk O, Mukharovska I. Psychological, Clinical and Socio-Demographic Predictors of Pain Catastrophizing in Chronic Pain Patients: Insights From a Cross-Sectional Study. International Neurological Journal. 2025;20(8):411-21. doi: 10.22141/2224-0713.20.8.2024.1124.
14. Mohajerani S. Relationship Between Psychological Distress and Physical Symptoms of Functional Dyspepsia With the Mediating Role of Pain Related Mental Imagery, Visceral Sensitivity, Pain Catastrophizing and Pain Self-Efficacy. Shenakht Journal of Psychology and Psychiatry. 2022;8(6):98-113. doi: 10.32598/shenakht.8.6.98.
15. Gerdle B, Dragioti E, Fischer MR, Ringqvist Å. Pain Intensity and Psychological Distress Show Different Associations With Interference and Lack of Life Control: A Clinical Registry-Based Cohort Study of ≫40,000 Chronic Pain Patients From SQRP. Frontiers in Pain Research. 2023;4. doi: 10.3389/fpain.2023.1093002.
16. Dimitrijević I, Hnatešen D, Radoš I, Budrovac D, Raguž M. Relationship Between Psychological Factors and Health-Related Quality of Life in Patients With Chronic Low Back Pain. Healthcare. 2024;12(24):2531. doi: 10.3390/healthcare12242531.

17. Vela J, Dreyer L, Petersen KK, Arendt-Nielsen L, Duch K, Amris K, et al. Quantitative Sensory Testing, Psychological Profiles and Clinical Pain in Patients With Psoriatic Arthritis and Hand Osteoarthritis Experiencing Pain of at Least Moderate Intensity. European Journal of Pain. 2023;28(2):310-21. doi: 10.1002/ejp.2183.

18. Roman-Juan J, Sánchez-Rodríguez E, Solé E, Castarlenas E, Jensen MP, Miró J. Psychological Factors and Pain Medication Use in Adolescents With Chronic Pain. Pain Medicine. 2023;24(10):1183-8. doi: 10.1093/pm/pnad075.

19. Ou-Yang Z-Y, Feng Y, Yang Y, Chen N-X, Su X-L, Zhang Q, et al. Oral Health-Related Quality of Life Among Chinese Chronic Orofacial Pain Patients With Psychological Health Problems: A Moderated Mediation Model. International Journal of Environmental Research and Public Health. 2023;20(4):3244. doi: 10.3390/ijerph20043244.

20. Li R, Rogers AH, Sujan AC, Zhou C, Thiagarajan P, Palermo TM, et al. Psychosocial Mechanisms Underlying the Transition From Acute to Chronic Postsurgical Pain in Youth Following Spinal Fusion: A 6-Month Longitudinal Study. Pain. 2025. doi: 10.1097/j.pain.0000000000003631.

21. Terradas-Monllor M, Ruiz MÁ, Ochandorena-Acha M. Postoperative Psychological Predictors for Chronic Postsurgical Pain After a Knee Arthroplasty: A Prospective Observational Study. Physical Therapy. 2023;104(1). doi: 10.1093/ptj/pzad141.

22. Roose E, Cools W, Leysen L, Wilgen Pv, Beckwée D, Timmermans A, et al. Psychological Factors Influencing Healthcare Utilization in Breast Cancer Survivors With Pain. Pain Medicine. 2024;25(12):768-80. doi: 10.1093/pm/pnae083.